

Application No.: 10/784860

Case No.: 58065US008

REMARKS

Claims 1-3 and 5-17 are pending. Claims 8-17 are withdrawn from consideration.  
Claims 2 and 4 have been canceled. Claim 1 is amended.

§ 102 Rejections

Applicants respectfully submit that according to MPEP 2131 "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." (citing *Verdegall Bros. V. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)).

Claims 1, 3 and 6 stand rejected under 35 USC § 102(b) as being anticipated by Gazit et al (US 5219640).

The Office Action states in part:

Gazit discloses a flexible circuit board that is useful in computer disc drives. The flexible circuit board is comprised of a dielectric substrate (12,20), an adhesive (14,18), and circuit lines (16).

The dielectric substrate (12,20) is a polyimide material such as Kapton (col 3 L 61-62 & L 68; col 4 L 3-4). The dielectric substrate (or polyimide layer) has a thickness of 25  $\mu\text{m}$ . The flexible circuit board has a flexing section where the dielectric substrate has been thinned to less than 15  $\mu\text{m}$  (col 8 L 25 & L 37-48). The removal of the polyimide layer in the flexing section can be done by chemical etching (col 5 L 22-27).

Applicants have amended claim 1 to include the limitation of claim 2 that the polyimide is a polyimide copolymer including carboxylic ester structural units in its polymeric backbone.

Applicants submit that the present rejection is moot because of the amendment of claim 1 to include the limitation of claim 2.

Based on the foregoing, Applicant(s) submit that the cited reference cannot support a 35 U.S.C. 102(b) rejection and respectfully requests that the rejection be withdrawn.

Claims 1-3 and 5-7 stand rejected under 35 USC § 102(e) as being anticipated by Yang (PG Pub 2002/0155280 A1).

The Office Action states in part:

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Application No.: 10/784860

Case No.: 58065US008

Yang teaches a complex circuit structures such as unsupported cantilevered leads (paragraph 0027). A bonding adhesive such as polyimide is used between a base material and a metal layer (paragraph 0049). The base material has an original thickness of about 25-50  $\mu\text{m}$ , is reduced to less than about 10  $\mu\text{m}$  (paragraph 0051).

Yang teaches that polyimide can be used as dielectric base material (paragraph 0026). Polyimides are commonly used as based materials for flexible electronic packages (paragraph 0004 & 0005).

The applied reference has a common inventor and a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention by another," or by an appropriate showing under 37 CFR 1.131.

Applicants have amended claim 1 to include the limitation that the polyimide is a polyimide copolymer including carboxylic ester structural units in its polymeric backbone.

Yang points out that the polyimide films commonly used as substrates for flexible circuits have a major drawback in that they absorb moisture. (See Yang at paragraph [0005]) Contrary to the Examiner's implication, Yang does not disclose that a polyimide may be used as a base material that may be etched to a controlled depth. Furthermore, Yang does not disclose polyimide copolymers including carboxylic ester structural units in the polymeric backbone and polycarbonates, which can be controllably etched, and which are elements of amended claim 1. Accordingly, the reference does not describe every element of the claimed invention.

Based on the foregoing, Applicant(s) submit that the cited reference cannot support a 35 U.S.C. 102(e) rejection and respectfully requests that the rejection be withdrawn.

Claims 1-3 and 5-7 are rejected under 35 U.S.C. 102(f) because the applicant did not invent the claimed subject matter.

The Office Action states in part:

The structural limitation of dielectric film having a thickness is reduced from 25-50  $\mu\text{m}$  to less than 10  $\mu\text{m}$  or less, is clearly disclosed in the pre-grant publication (see paragraph 0051). The publication has only one inventor.

Applicants have amended claim 1 to include the limitation that the polyimide is a polyimide copolymer including carboxylic ester structural units in its polymeric backbone.

Yang points out that the polyimide films commonly used as substrates for flexible circuits have a major drawback in that they absorb moisture. (See Yang at paragraph [0005]) Contrary to the Examiner's implication, Yang does not disclose that a polyimide may be used as a base material that may be etched to a controlled depth. Furthermore, Yang does not disclose

Application No.: 10/784860

Case No.: 58065US008

polyimide copolymers including carboxylic ester structural units in the polymeric backbone and polycarbonates, which can be controllably etched, and which are elements of amended claim 1. Accordingly, the reference does not describe every element of the claimed invention.

Based on the foregoing, Applicant(s) submit that the cited reference cannot support a 35 U.S.C. 102(f) rejection and respectfully requests that the rejection be withdrawn.

### § 103 Rejections

Applicants respectfully submit that according to MPEP 2142, to establish a case of prima facie obviousness, three basic criteria must be met: 1) there must be some suggestion or motivation, either in the references or generally known to one skilled in the art, to modify or combine reference teachings, 2) there must be reasonable expectation of success, and 3) prior art references must teach or suggest all the claim limitations. The ability to modify the method of the references is not sufficient. The reference(s) must provide a motivation or reason for making the changes. *Ex parte Chicago Rawhide Manufacturing Co.*, 226 USPQ 438 (PTO Bd. App. 1984).

Claims 1, 4-7, 9-10 and 12 stand rejected under 35 USC § 103(a) as being unpatentable over Gazit et al (US 5219640) in view of Wolf et al (US 4847139).

The Office Action states in part:

Gazit discloses a flexible circuit board that is useful in computer disc drives. The flexible circuit board is comprised of a dielectric substrate (12,20), an adhesive (14,18), and circuit lines (16).

The dielectric substrate (12,20) is a polyimide material such as Kapton (col 3 L 61-62 & L 68: col 4 L 3-4). The dielectric substrate (or polyimide layer) has a thickness of 25  $\mu$ m. The flexible circuit board has a flexing section where the dielectric substrate has been thinned to less than 15  $\mu$ m (col 8 L 25 & L 37-48). The removal of the polyimide layer in the flexing section can be done by chemical etching (col 5 L 22-27).

Gazit teaches a flexible circuit board having a recessed region that has a thinner thickness of the dielectric film. Gazit however is silent about the polyimide material has a carboxylic ester group.

Wolf teaches a flexible circuit comprised of a base material and a conductive material.

The base material can be a polyimide film having the thickness from about 20  $\mu$ m to 250  $\mu$ m (col 2 L 44-48 & L 66-68 & col 3 L 1-2).

The conductive material is laminated onto the surface(s) of the base material (col 3 L 61-64).

The base material comprises functional groups such as carboxylic ester groups which could enhance adhesion to the substrate (co base) surface (col 5 L 27-34).

In view of the prior art teachings, one skill in the art would fabricate a flexible circuit board by choosing polyimide copolymer having carboxylic ester groups because it enhances adhesion between the substrate surface and the metallic foil.

Regarding to dielectric film having an orifice, the examiner takes the position that such structure is known in the printed wiring board field and the size of the orifice is just

Application No.: 10/784860

Case No.: 58065US008

a matter of design choice.

Because only claims 1-3 and 5-7 are pending in the present application, Applicants are unsure to which claims this rejection is directed, but will assume it is directed at least at claims 1 and 2.

Applicants submit that it is unclear whether Gazit discloses that a polymer material can be thinned by chemical etching or only by laser ablation. Gazit appears to distinguish between removing "some or all" of the polymer layer [in the z direction] as is shown in Figs. 1,3, or Figs. 4,5 (*see, e.g.*, Gazit at col. 5, lines 6-9) and "thinning" the polymer layer (*see, e.g.*, Gazit at col. 5, lines 10-21). In any event, even if Gazit discloses thinning a polyimide material by chemical etching, Gazit does not enable it. As is stated in *Ex Parte Gould*, 231 USPQ 943 (BPAI 1986), a reference itself must have an enabling disclosure to be used as a proper reference. Section 102(b) of 35 U.S.C. and its predecessor statutes have been interpreted as requiring the description of the invention in a publication to be sufficient to put the public in possession of the invention.

As explained in the present patent application, polyimides typically swell uncontrollably when exposed to an etchant solution. (*See* specification, e.g., at p. 7, line 23 to p. 8, line 7) While this would not be a significant issue when etching all the way through the polyimide material, it is highly significant when etching only partially through a material, especially when the thickness of the material is reduced to less than 20  $\mu\text{m}$ .

Applicants further submit that the Office Action misinterprets the teachings of Wolf. Applicants point out that Wolf does not disclose a base material comprising a polyimide including carboxylic ester structural units in the polymeric backbone, as the Office Action suggests. It instead discloses a way to make a flexible circuit by means of a technique using a surface activation treatment to enhance the adhesion of the base material to a conductive layer. (*See* Wolf at col. 1, line 65 to col. 2, line 24) It is the activator, which is an organometallic, that may include carboxylic ester groups. (*See* Wolf, col. 5, lines 15-35)

Neither Gazit nor Wolf disclose polyimide copolymers including carboxylic ester structural units in the polymeric backbone and polycarbonates, which can be controllably etched, as is explained in the present specification, e.g., at p. 8, lines 8-28 and p. 10, line 9 to p. 11, line 16.

Application No.: 10/784860

Case No.: 58065US008

Applicants respectfully submit that the references cannot support a case of *prima facie* obviousness as to the claims because, among other possible reasons, the cited references do not provide a motivation or suggestion for a dielectric film comprising a polycarbonate or polyimide copolymer including carboxylic ester structural units in the polymeric backbone etched to a controlled thickness of less than about 20  $\mu\text{m}$  from an original thickness of about 25  $\mu\text{m}$  or greater because of the reasons stated above. In addition, these references do not disclose all the elements of the present invention because they do not disclose a dielectric film comprising a polycarbonate or polyimide copolymer including carboxylic ester structural units in the polymeric backbone etched to a controlled thickness of less than about 20  $\mu\text{m}$  from an original thickness of about 25  $\mu\text{m}$  or greater.

For these reasons, Applicant(s) submit that the cited references will not support a 103(a) rejection of the claims invention and request that the rejection be withdrawn.

Claims 1, 4-7, 9, 10 and 12 stand rejected under 35 USC § 103(a) as obvious over Yang et al (US6403211).

The Office Action states in part:

Yang discloses a flexible circuit board comprised of a dielectric film and a copper conductive pattern (col 1 L 10-13).

The dielectric film can be a polyimide material (col 2 L 52-56). The copper pattern formed onto the surfaces of the dielectric film (col 6 L 32-42). The dielectric film has an initial film thickness of from about 25-125  $\mu\text{m}$  (col 6 L 18-19).

Yang uses an alkaline etchant which comprises an alkali metal salt and a solubilizer, on the dielectric film for obtaining a desired dielectric film thickness.

Yang teaches the present invention but is silent about the dielectric film is etched to a thickness of less than 25  $\mu\text{m}$  (or less than 15  $\mu\text{m}$ ) from its original thickness.

However, in view of Yang's teaching, it would have been obvious that Yang's method could produce the same product as claimed by the applicant because the prior art uses the same etchant and same processing steps & conditions as disclosed by the applicant.

Because only claims 1-3 and 5-7 are pending in the present application, Applicants are unsure to which claims this rejection is directed, but will assume it is directed at least at claims 1 and 2.

Applicants respectfully traverse the Office Action statement that Yang teaches how to obtain a desired polyimide film thickness. Yang specifically teaches using liquid crystal polymers to make flexible circuits having through-holes and related shaped voids. (See, e.g.,

Application No.: 10/784860

Case No.: 58065US008

Abstract; col. 2, lines 34-48 and 51-54; and col. 6, lines 19-24) It is known in the art that etching completely through a polymer film is much easier than etching partially through the polymer. For example, a polymeric material may have different surface and bulk etch rates. While this would not be significant when etching all the way through the material, it is highly significant when etching only partially through a material, especially when the etching reduces the thickness of the material to less than 20  $\mu\text{m}$ . Furthermore, Yang teaches away from using polyimide films by pointing out that the polyimide films commonly used as substrates for flexible circuits have a major drawback in that they absorb moisture. (See Yang at col. 1, lines 36-47)

Applicants respectfully submit that the reference cannot support a case of *prima facie* obviousness as to the claims because, among other possible reasons, the cited reference does not provide a motivation or suggestion for a dielectric film comprising a polycarbonate or polyimide copolymer including carboxylic ester structural units in the polymeric backbone etched to a controlled thickness of less than about 20  $\mu\text{m}$  from an original thickness of about 25  $\mu\text{m}$  or greater because of the reasons stated above. Furthermore, it would not be obvious from the teachings of Yang that etching a film comprising a polycarbonate or a polyimide to a controlled depth would be successful. In addition, Yang does not disclose all the elements of the present invention because it does not disclose a dielectric film comprising a polycarbonate or polyimide copolymer including carboxylic ester structural units in the polymeric backbone etched to a controlled thickness of less than about 20  $\mu\text{m}$  from an original thickness of about 25  $\mu\text{m}$  or greater.

For these reasons, Applicant(s) submit that the cited references will not support a 103(a) rejection of the claims invention and request that the rejection be withdrawn.

In addition to the foregoing arguments, Applicant(s) submit that a dependent claim should be considered allowable when its parent claim is allowed. *In re McCairn*, 1012 USPQ 411 (CCPA 1954). Accordingly, provided the independent claims are allowed, all claims depending therefrom should also be allowed.

Application No.: 10/784860

Case No.: 58065US008

Based on the foregoing, it is submitted that the application is in condition for allowance. Withdrawal of the rejections under 35 U.S.C. 102 and 103 is requested. Examination and reconsideration of the claims are requested. Allowance of the claims at an early date is solicited.

The Examiner is invited to contact Applicant(s)' attorney if the Examiner believes any remaining questions or issues could be resolved.

Respectfully submitted,

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Date

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